	Design value calculated			
Parameter		Units	Tolerance	Notes
1.1 Project Management				
General PHYSICS Requirements, Upsilons				to get high enpough statistics in p+p, p+A and A+A data sets with mass resolution and signal to background sufficient to separate the three states of the ϒ family.
Pseudorapidity coverage, η (eta)	≤|1.1|	-	(range)	
Azimuthal coverage	360	deg	-	full 2π coverage
Inner tracker radius	≤80	cm	max	
Data acquisition rate	15	kHz	nom	
Trigger efficiency	90	%	min	for electrons from γ-> e^+e^- in p+p and p+A
Track reconstruction efficiency	90	%	min	for $p_T > 3$ GeV/c
Track reconstruction purity	90	%	min	for $p_T > 3$ GeV/c
Momentum resolution	1.2	%	nom	for p_T in the range 4-10 GeV/c
Electron identification efficiency	70	%	min	in Central Au+Au at for $p_T = 4$ GeV/c
General PHYSICS Requirements, jets				to cover jet energies of 20-70 GeV, for all centralities, for a range of jet sizes with high statistics and performance insensitive to the details of jet fragmentation
Energy resolution	< 120 %/√(E_{jet})	-	max	in p+p for R = 0.2 -0.4 jets
Energy resolution	< 150 %/√(E_{jet})	-	max	in central Au+Au for R = 0.2 jets
Energy resolution	-	-	-	including effect of underlying event such that scale of unfolding on raw yields is less than a factor of 3
Energy scale uncertainty	3	%	max	for inclusive jets
Jet measurement, R	0.20	-	Minimum	segmentation no coarser than Δη x Δϕ ~0.1 x 0.1
Underlying event influence event-by-event	ATLAS method	-	-	large coverage HCal/EMCal)
Energy measurement	insensitive	-	-	to softness of fragmentation (quarks or gluons_ - HCal + EMCal
Jet trigger capability	without jet bias	-	-	
Rejection	95.00	%	min	of high p_T charged track backgrounds (HCal)
General PHYSICS Requirements, dijets				to achieve large acceptance in conjunction with the general requirements for jets, as above
Containment of opposing jet axis	80	%	min	
Full containment	70	%	min	for R = 0.2 dijets
Systematic uncertainty	10	%	max	for R_{AA} and A_J as measured (also key in p+A, onset of effects)
General PHYSICS Requirements, fragmentation functions				for unbiased measurement of jet energy acceptance
Tracking resolution limit	40	GeV/c	min	(dp/p < 0.2% x p)
Independent measurement of p and E	capable	-	-	(z=p/E)
General PHYSICS Requirements, heavy quark jets				for unbiased measurement of jet energy acceptance
DCA precision	100	microns	max	for electron $p_T > 4$ GeV/c
Electron identification for high for $p_T >$	4	GeV/c	min	
General PHYSICS Requirements, direct photon				for identifying photons
EMCal segmentation Δη x Δϕ	0.024 x 0.024	-	nom	
EMCal resolution for photon ID	15	%/√(E)	min	
EMCal cluster trigger	capable	-	-	in p+p and p+A at with rejections > 100 for $E_\gamma > 10$ GeV
General PHYSICS Requirements, high statistics				ability to sample high statistics for p+p. p+A, A+A at all centralities requires high rate, high throughput DAQ
Data acquisition rate	15	kHz	nom	
1.2 Superconducting Magnet				
Magnet PHYSICS Requirements				Note: BABAR magnet acquired
Momentum resolution (Δp/p)	1.0	%	nom	magnet and tracking system capability at 10 GeV/c (order of magnitude)
Azimuthal coverage	360	deg	-	full 2π coverage
Pseudorapidity coverage, η (eta)	≤|1.1|	-	(range)	
Central field	1.5	T	approx	
Inner radius	140	cm	approx	
Field measurement accuracy	1	%	max	measurements to correct for nonuniformities, especially close to the plug doors

	Design value calculated			
Parameter		Units	Tolerance	Notes
Magnet Mechanical				
Conductor material (magnet coil)	niobium titanium	-	-	Rutherford-type superconducting cable co extruded with an outer aluminum matrix
Cable construction: number of strands	16.0	-	-	
Strand diameter	0.8	mm	nom	
Copper to superconductor ratio	1:1	-	-	
Filament size	40.0	µm	max	
Twist pitch	25.0	µm	nom	
Cable shape	rectangular	-	-	
Cable size	1.4 x 6.4	mm x mm	nom	
Aluminum matrix size, body	8.49 x 20	mm x mm	nom	
Aluminum matrix size, ends	4.93 x 20	mm x mm	nom	
Coil offset with respect to outer cryostat	30.0	mm	nom	axial offset towards the lead-in end
Solenoid Inner Radius	142.0	cm	+/- 0.5	Measured within this tolerance by BNL survey
Solenoid Outer Radius	177.0	cm	+/- 0.6	Measured within this tolerance by BNL survey
Solenoid length	384.88	cm	+/-.04	
Solenoid estimated weight	30865.00	lbs	est	without stack, fom BABAR lifting analyses
Stack weight	3000.00	lbs	est	rough estimate
Coil length	3512.00	mm	+/- 0.2	measured as built (3513 from BABAR paper)
coil radial width	40.80	mm	spec	from BABAR paper
Coil radius (at mid width)	1530.20	mm	spec	from BABAR paper
Relief valve, crack pressure rating				
Burst Disk design pressure rating				
				**For other dimensions consult the sPHENIX magnet website at: https://collab.external.bnl.gov/sites/sPHENIX-Magnet/SitePages/Parameters.aspx
Magnet Electrical				
Solenoid main coil current	4596.00	Amps	max	from BABAR paper
Solenoid current density (main coil)	1.20	kA/sq mm	calc	(outer coil, 1/2 this on the central coil) from BABAR paper
Solenoid Inductance	2.57	H	spec	from BABAR paper
Coil Stored energy	27.0	MJ	spec	from BABAR paper
Critical current	12,680	Amps	max	
Current safety margin	2.5	-	-	
Dump resistor	68.00	mΩ		used to quickly reduce current in the event of quench
Ground current resistor	67.00	mΩ		limits ground current should coil fault
Cable resistance	1.25	mΩ		SLAC configuration
Voltage across magnet	6.25	V		
Curren through dump resister	92.00	A		
Peak power supply voltage	12.10	V		
# of voltage taps				
# of LVDT's				
# of strain gages	28	-	-	counted
Service building compressor	150.00	kW	nom	480 VAC
Coldbox and magnet valvebox	6.00	kW	nom	120 VAC
Magnet Magnetic				
Central Field	1.5	Tesla	nom	magnet calculations indicate 1.4 T in sPHENIX config.
Time to reach full field	30.70	minutes		@ 2.5 A/sec ramp rate
Tme constant, slow discharge	33.30	minutes		slow discharge through freewheeling diode and cable resistance
Time to decay fom 4.6 kA to 100 A, slow discharge	2.10	hours		
Tme constant, fast discharge through dump resistor	36.76	seconds		slow discharge through freewheeling diode and cable resistance
Time to decay fom 4.6 kA to 100 A, fast discharge through dump resistor	2.34	minutes		
Number of inner windings	536			
Number of outer windings	531			
Magnet Cryogenic				
Operating Temp	4.50	K	max	
Cryogen	LHe	-	-	
Cold mass heat load (operating temp)	70	W	est	
Outer heat shield temperature	40	K	nom	cooled by cold mass boil off

	Design value calculated			
Parameter		Units	Tolerance	Notes
Outer heat shield heat load	110	W	est	
Transfer line, dewar and bayonet losses	14	W	est	114 W if plant is located in service building
Flow Rate, leads	0.2	g/s	nom	
Flow Rate, shield	0.35	g/s	nom	
Inlet Pressure				
Pressure Drop				
Storage dewar capacity	300.00	liter	nom	Required to allow liquid draw of 5 g/s and vapor generation of 1 g/s to allow rampdown of the magnet within 1 hr
Compressor dimensions	2.3x2.0x2.0 H	m x m x m	nom	(if self-contained helium supply system is selected)
Coldbox rating	325-400	W		
Local Gas Storage	6000.00	gal		@ 13 bar to allow summer shutdown testing
Cooling Water	50.00	gpm		@20psid
Conditioned water	4.00	lpm		50/50 water for cryogenic expanders work extraction heat exchangers
Instrument air	8.00	scfm		@-40C, 80 psig
Liquid nitrogen				to be supplied from existing PHENIX LN2 dewar; new LN2 transfer line needed
1.3 Tracker				Note: parameters other than PHYSICS Requirements broken into 4 subsections: (1) Re-Use Inner PIXELS, (2) new INNER MAPS PIXELS, (3) Silicon Strip Outer Tracker and (4) TPC Chamber Outer Tracker
Tracker PHYSICS Requirements				Note: BABAR magnet acquired
Azimuthal coverage	360	deg	-	full 2π coverage
Tracker radius	≤80	cm	max	
Momentum resolution	1.2	%	nom	for p_T in the range 4-10 GeV/c
Tracking resolution limit	40	GeV/c	min	(dp/p < 0.2% x p)
Electron identification efficiency	70	%	min	in Central Au+Au at for p_T = 4 GeV/c
Read Out Speed	15	kHz	nom	
Inner Re-Use PIXELS Option Mechanical				
Acceptance angle	36.80	deg	nom	
Inner radius	6.60	cm	min	
Radial Thickness (at centerline)	TBD	cm	max	
Outer Radius	TBD	cm	max	
Weight Estimate	TBD	lb	-	Rough Engineering estimate based on similar equipment
Active area Length	TBD	cm	est	Calculated from acceptance
Electronics heat generation	TBD			
Coolant	TBD			
Coolant Inlet temp	TBD			
Coolant inlet pressure	TBD			
Coolant Flow rate	TBD			
Coolant Pressure drop	TBD			
Inner Re-Use PIXELS Option Electrical				
# of Layers	2	each	-	Existing from PHENIX VTX detector with reconfigured with spares added to provide full coverage.
# of ladders layer 1	12			
# of ladders layer 2	24			
Pixel size	50 x 425	µm x µm	-	
Pixels per ladder	131072	pixels/lad	-	4 sensors/ladder x 4 ROCs/sensor x 8192 pixels/ROC =131,072
# of channels	TBD			
# LV Cables	TBD			
LV Cable size (dia)	TBD			
LV Cable length	TBD			
# Signal cables	TBD			
Signal Cable size (dia)	TBD			
Signal Cable length	TBD			
Radiation length/ladder	1.28	%		
Inner new MAPS PIXELS Option Mechanical				
Acceptance angle	36.80	deg	nom	
Inner radius	TBD	cm	min	
Radial Thickness (at centerline)	TBD	cm	max	
Outer Radius	TBD	cm	max	
Weight Estimate	6350.00	lb	-	Rough Engineering estimate based on similar equipment
Active area Length	213.88	cm	est	Calculated from acceptance
Electronics heat generation	TBD			

	Design value calculated			
Parameter		Units	Tolerance	Notes
Coolant	TBD			
Coolant Inlet temp	TBD			
Coolant inlet pressure	TBD			
Coolant Flow rate	TBD			
Coolant Pressure drop	TBD			
Inner new MAPS PIXELS Option Electrical				
# of Layers	3	each	-	2 layers of existing pixels (or 3 layers new) 5 layers new silicon strip sensors
# of ladders layer 1	TBD			
# of ladders layer 2	TBD			
# of ladders layer 3	TBD			
Pixel size	30 x 30	µm x µm	-	
Pixels per ladder	TBD	pixels/lad	-	
# of channels	TBD			
# LV Cables	TBD			
LV Cable size (dia)	TBD			
LV Cable length	TBD			
# Signal cables	TBD			
Signal Cable size (dia)	TBD			
Signal Cable length	TBD			
Radiation length/ladder	0.30	%		
Outer Silicon Strip Option Mechanical				
Acceptance angle	36.80	deg	nom	
Inner radius	TBD	cm	min	
Radial Thickness (at centerline)	TBD	cm	max	
Outer Radius	70.00	cm	max	
Weight Estimate	TBD	lb	-	Rough Engineering estimate based on similar equipment
Active area Length	104.80	cm	est	Calculated from acceptance at outer radius
Electronics heat generation	TBD			
Coolant	TBD			
Coolant Inlet temp	TBD			
Coolant inlet pressure	TBD			
Coolant Flow rate	TBD			
Coolant Pressure drop	TBD			
Outer Silicon Strip Option Electrical				
# of Layers	3	each	-	layers 3 thru 5 for detector reusing PHENIX pixels (layers 4 thru 6 for MAPS)
# of ladders layer 3 (4 when MAPS is interior)	36	-	-	
# of ladders layer 4 (5 when MAPS is interior)	44			
# of ladders layer 5 (6 when MAPS is interior)	48			
# of modules/ladder layer 3 (4)	3	-	-	ladders have 2 sublayers-> 2x3x36 = 216 sensors/ladder
# of modules/ladder layer 4 (5)	7			ladders have 2 sublayers-> 2x7x44 = 616 sensors/ladder
# of modules/ladder layer 5 (6)	14			ladders have 1 sublayer-> 1x14x48 = 672 sensors/ladder
sensor thickness	320	µm		prototype 240 µm sensors are in production and may be used for layers 3 & 4 to minimize multiple scattering within sensor material
sensor length	96	mm		
sensor width (in azimuth)	92.16	mm		
# LV Cables	TBD			
LV Cable size (dia)	TBD			
LV Cable length	TBD			
# Signal cables	TBD			
Signal Cable size (dia)	TBD			
Signal Cable length	TBD			
total radiation length	4.2	%		% for layer 3, 1.2% for layer 4, 1% for layer 5
Outer TPC option Mechanical				
Acceptance angle	36.80	deg	nom	
Inner radius	30.00	cm	min	
Radial Thickness (at centerline)	50.00	cm	max	
Outer Radius	80.00	cm	max	
Weight Estimate	TBD	lb	-	Rough Engineering estimate based on similar equipment
Active area Length	160.00	cm	est	Calculated from acceptance

	Design value calculated			
Parameter		Units	Tolerance	Notes
Pad size	12.00	mm^2		with 45 radial segments
Electronics heat generation	TBD			
Coolant	TBD			
Coolant Inlet temp	TBD			
Coolant inlet pressure	TBD			
Coolant Flow rate	TBD			
Coolant Pressure drop	TBD			
TPC Gas	T2K or ALICE gas			Trdeoff study needed
Outer TPC Option Electrical				
Channel count	247,400	each	-	
Avalanche Technology	Quadruple GEM	-	-	(Same as ALICE upgrade design
Gas Gain	2000			(Same as ALICE upgrade design
# LV Cables	TBD			
LV Cable size (dia)	TBD			
LV Cable length	TBD			
# Signal cables	TBD			
Signal Cable size (dia)	TBD			
Signal Cable length	TBD			
Field Cage Central Potential	32000	V	-	400 V/cm, conservatively high

	Design value calculated			
Parameter		Units	Tolerance	Notes
Elecro-Magnetic Calorineter				
EMCal PHYSICS Requirements				
Azimuthal coverage	360	deg	-	full 2π coverage
Pseudorapidity coverage, η (eta)	≤|1.1|	-	(range)	
EMCal inner radius	90	cm	min	
Energy Resolution	<=15%/sqrt(E)			
EMCal segmentation Δη x Δϕ	0.024 x 0.024	-	nom	
EMCal cluster trigger	capable	-	-	in p+p and p+A at with rejections > 100 for E_γ > 10 GeV
Sampling Fraction	~2.3	%	nom	acceptable
radiation length	~7	mm	nom	acceptable
Moliere radius	~2.3	cm	nom	acceptable
Additional noted qualitative requirements	-	-	-	Fit inside sPHENIX Magnet
				High Segmentation for heavy ion collisions
				Occupy minimal radial space (short X_0, small R_M)
				Minimal cracks and dead regions
				zProjective (approximately)
				Readout works in a magnetic field
EMCal Mechanical				(See drawing SP00-000-004 for envelope design)
Absorber Material	tungsten powder & Epoxy	-	-	estimated density: 11.91 g/cu cm
Acceptance angle	36.80	deg	nom	
Inner radius	90.00	cm	min	Includes Light collection and readout; active detector begins at radius = 97.5 cm
Radial Thickness (at centerline)	26.13	cm	max	Includes EMCal to Inner HCal support rails and caliration fiber(s)
Outer Radius	116.13	cm	max	
Active area Thickness (AKA tower length)	144.00	cm	max	
Absorber (active area) Length	299.00	cm	+/-0.5	
Weight Estimate	61000.00	lb	max	~31 US ton estimate based on dimensional approximations
Readout clearance (at outer radius)	7.50	cm	max	
# of Supermodules	64	-	-	
Tungsten specification	THP Technon 100 mesh	-	-	>=99.9% W purity, <.01% impurities (Fe, Ni, O2, Co, Cr, Cu, Mo), bulk density (solid) >=18.5 g/cm^3
Tungsten Particle Size	<100	μm		
Tungsten powder density	>=11.25	g/cm^3		
nominal density of W/SciFi/Epoxy bricks	10	g/cm^3	nom	
Electronics heat generation	6.45	kW	est	estimated 262.6 mW/channel * 24576 Channels
Coolant	TBD	-	-	
Coolant Inlet temp	TBD	-	-	
Coolant inlet pressure	TBD	-	-	
Coolant Flow rate	TBD	-	-	
Coolant Pressure drop	TBD	-	-	
EMCal Light Collection				
# of towers (1 tower per channel)	24576	-	-	96 longitudinally (in z) x 256 azimuthally (in phi) basic Tungsten-Scintilating fiber-Epoxy (W/SciFi) unit of fabrication
# of SciFi blocks (4 towers per block)	6144	-	-	
# of modules (2 x8 towers per module)	4	-	-	96 longitudinally (in z) x 256 azimuthally (in phi) basic Tungsten-Scintilating fiber-Epoxy (W/SciFi) unit of fabrication
# of modules/sector	24	-	-	384/16 = 384
# towers/sector	384	-	-	
# of SiPM's	98304	-	-	4 SiPMs per tower
# of Sectors	64	-	-	2 longitudinally 32 azimuthally
fiber material	Kuraray SCSF78	-	-	(blue)
cladding	single			
core material	polystyrene			
cladding material	polymethyl-methacrylate			
emmission peak	450.00	nm	spec	
decay time	2.80	ns	spec	
attenuation length	>=4.0	m		
embedded fiber diameter	0.47	mm	nom	
embedded fiber spacing	1.00	mm	nom	At inner radial end of towers, grows along fiber length from inner radius to outer radius in proportion to tower dimension taper
Epoxy spec	Epo-Tek 301			
pot life	1.50	hr	+/-.5	
index of refraction	1.52	-	-	at 589 nm

Parameter	Design value calculated	Units	Tolerance	Notes
spectral transmission	>= 99	%		at 382-980 nm
Light guide base area	392.00	mm^2		1 light guide per tower tower output end dimensions 19.8 mm x 19.8 mm
Light guide SiPM active area	36.00	mm^2		4 SiPM per guide 3 mm x 3mm per SiPM
Light guide to SiPM coupling efficiency	71.00	%		As measured in prototypes using silicone cookies
				Note: SiPM's to be gain matched and share common bias voltage for each 4 SiPM set per guide
EMCal Electronics				
# of channels (1 preamp per channel)	24576	-	-	
# of modules	3072	-	-	8 blocks per module blocks are common sized
# of supermodules	64	-	-	48 modules per supermodule 2 supermodules in length x 32 modules in circumference
# LV Cables	64	-	-	
LV Cable size (dia)	0.25	in	nom	
LV Cable length	10	m	nom	
# Signal cables	3072	-	-	
Signal Cable size (dia)	0.25	in	nom	
Signal Cable length	10	m	nom	
# Comm cables	64	-	-	
Comm Cable size (dia)	0.25	in	nom	
Comm Cable length	10	m	nom	
# Bias cables	3072	-	-	
Bias Cable size (dia)	0.20	in	nom	
Bias Cable length	10	m	nom	
Outer Hadronic Calorineter				
Outer HCal PHYSICS Requirements				
Azimuthal coverage	360	deg	-	full 2π coverage
Pseudorapidity coverage, η (eta)	≤|1.1|	-	(range)	
Outer HCal inner radius	182	cm	min	envelope; active area is further out
Radial thickness	87	cm	max	envelope; active area is smaller
Energy absorbed	>95	%		Innner + Outer HCal Energy resolution requirement σ/E = 100%/ √E in heavy ion collisions
HCal segmentation Δη x Δϕ	~0.1 x 0.1	-	nom	
Light collection per fiber	~80	%		
Total towers (η x ϕ)	24 x 64	-	-	1536 total (tower = electronic signal channel)
nuclear interaction length	6		nom	total Inner + Outer HCals
number of gap crossings by a radial particle	4	-	min	to minimize channeling
Tower size (η x ϕ) (approximate)	15 x 13	cm		
Sampling fraction at inner radius	0.037	-	-	
Sampling fraction at outer radius	0.028	-	-	
Outer HCal Mechanical				
Absorber Material	1006 steel	-	-	High magnetic permeability steel (min rel perm =100)
Acceptance angle	36.8	deg	nom	(angle with respect to beam orbit; equal to η =1.1)
Stay clear radial clearance between cryostat and Outer HCal	4.0	cm	min	Outer Hcal combs must be outside of this clearance
Inner radius (envelope)	182.0	cm	min	Calculated from Magnet outer dim + 4 cm clearance
Inner radius (active area)	183.0	cm	min	
Radial Thickness (active area at centerline)	80.5	cm	nom	
Clearance for outer electronics	5.0	cm	nom	
Outer Radius (active area)	263.5	cm	nom	
Outer Radius (envelope)	268.5	cm	max	Calculated (inner + thickness)
Absorber (active area) Length	610.0	cm	+1/-0	Calculated from acceptance
Absorber (envelope) Length	722.0	cm	+1/-0	Includes end caps
Weight Estimate	854000	lb	est	427 US ton Estimate based on dimensional approximations
Weight per module	26688	lb	est	=1/32 of estimated total weight (13.34 US tons each)
Stay clear clearance (beyond envelope outer radius)	7.5	cm	nom	
# of Absorber Plates	320	-	-	
Absorber plate thickness at inner radius	26.10	mm	-	
Absorber plate thickness at outer radius	42.30	mm	-	
# of sectors	32	-	-	Note: each sector is 2 towers in ϕ; each tower is 5 tile gaps in ϕ; each sector is 24 towers (tiles) in η; total 48 towers per sector
Electronics heat generation	0.40	kW	est	estimated 262.6 mW/channel * 1536 Channels

	Design value calculated			
Parameter		Units	Tolerance	Notes
Coolant	Ambient air			
Coolant Inlet temp	50.00	F	nom	(HVAC design requirement)
Coolant inlet pressure	n/a	-	-	Heat removal to be by natural convection
Coolant Flow rate	n/a	-	-	
Coolant Pressure drop	n/a	-	-	
Outer HCal Light Collection				
tile gap	8.50	mm	+/-.5	
tile thickness	7.00	mm	+/-.5	
tile inclination	12	deg	-	calculated for min 4 gap crossings by any radial line, at radial crossing of tile centerline ("tilt angle")
# of gaps	320	-	-	same as # of tiles and # of absorbers
# of tiles per gap	24	-	-	
# of SiPM's	7680	-	-	one per tile
Tile material	doped/extruded polystyrene	-	-	
Scintillation dopant: PTP & POPOP	1.5, 0.01, respectively	%	nom	
Tile reflective coating	(proprietary)	-	-	by surface exposure to aromatic solvents (UNIPLAST)
Tile wrapping thickness: Aluminum foil/cling wrap/black TEDLAR	0.1/30/100	mm/μm/μm	nom	
Tile wrapping thickness	0.23	mm	+/-.1	Total
Tile attenuation length	30.00	mm	nom	perpendicular to extrusion direction
embedded fiber material	Kuraray Y11	-	-	wavelength shifting fiber: Formulation: 200, K-27, S-type, single clad
embedded fiber diameter	1.00	mm	nom	round
Fiber numerical aperature (NA)	0.55	-	-	
Fiber emmission angle	33.70	deg	nom	
Fiber trapping efficiency	3.10	%	nom	
Fiber core material	polystyrene	-	-	
Fiber core attenuation length	>2	m	-	
Fiber core density	1.05	g/cc	nom	
Fiber core refractive index	1.49	-	nom	
Fiber cladding thickness	0.02	mm	nom	
Fiber cladding material	PMMA	-	-	polymethylmethacrylate
Fiber cladding density	1.19	g/cc	nom	
Fiber cladding refractive index	1.49	-	nom	
Fiber color	green	-	-	
Fiber emmission peak	476.00	nm	nom	
Fiber absorption peak	430.00	nm	-	
Fiber attenuation length	3.50	m	minimum	
Minimu fiber bending radius	100.00	mm	minimum	
Optical cement	Epotek 3015	-	-	
Outer HCal Electronics				
# of channels (1 preamp per channel)	1536	-	-	(5 SiPM's per channel)